

TECHNICAL PRODUCT SHEET

UF

Ultrafiltration System



System Overview

The Ultrafiltration (UF) System is a membrane-based, pressure-driven filtration solution engineered to remove suspended solids, turbidity, color pigments (up to 99.97%), and nearly all bacteria and viruses from wastewater. Operating at the molecular level (~40 Angstrom), UF delivers high-efficiency separation with consistent performance across a wide range of influent conditions.

This advanced treatment step uses semi-permeable membranes to create a physical barrier between clean water and contaminants. By applying moderate pressure, the system produces ultra-clear effluent with minimal chemical input and low energy consumption. Its compact, modular design supports flexible installation, whether as a standalone polishing system or as a retrofit to existing treatment infrastructure. Available in skid-mounted or fully containerized configurations, the UF System offers a reliable, low-maintenance solution that is both space- and cost-efficient.



Integration with Miracell® Ultra

The Ultrafiltration System is fully integrated into the Miracell® Ultra platform, functioning as the final membrane filtration stage in a multi-step treatment process. In this configuration, UF works in tandem with the Miracell® Rotating Biological Contactor (RBC), sedimentation, and optional media filtration to produce consistently high-quality effluent.

This integrated approach enables the system to meet or exceed the most stringent regulatory standards for discharge and reuse. By combining biological treatment with membrane-level filtration, Miracell® Ultra provides a compact, energy-efficient solution that requires minimal operational oversight, ideal for modern wastewater management needs.

Key Features and Benefits



High Filtration Efficiency

Removes particles as small as 0.01 microns (10 nanometres), producing ultra-clear, high-quality effluent suitable for discharge or reuse.



Compact and Modular

Available in skid-mounted or containerized formats for easy integration into existing systems or rapid deployment in remote locations.



Energy Efficient

Operates at low pressures (typically 1 to 4 bar), significantly reducing energy consumption without compromising performance.



Low Chemical Demand

Equipped with backwash and clean-in-place (CIP) systems that minimise chemical use and extend membrane life.



Remote Monitoring and Control

Supports integration with Supervisory Control and Data Acquisition (SCADA) systems, Programmable Logic Controllers (PLC), or Miracell® Smart for automated monitoring and control.



Durable Materials

Constructed with robust polyvinylidene fluoride (PVDF) or polyethersulfone (PES) membranes housed in reinforced casings for long-term reliability and fouling resistance.

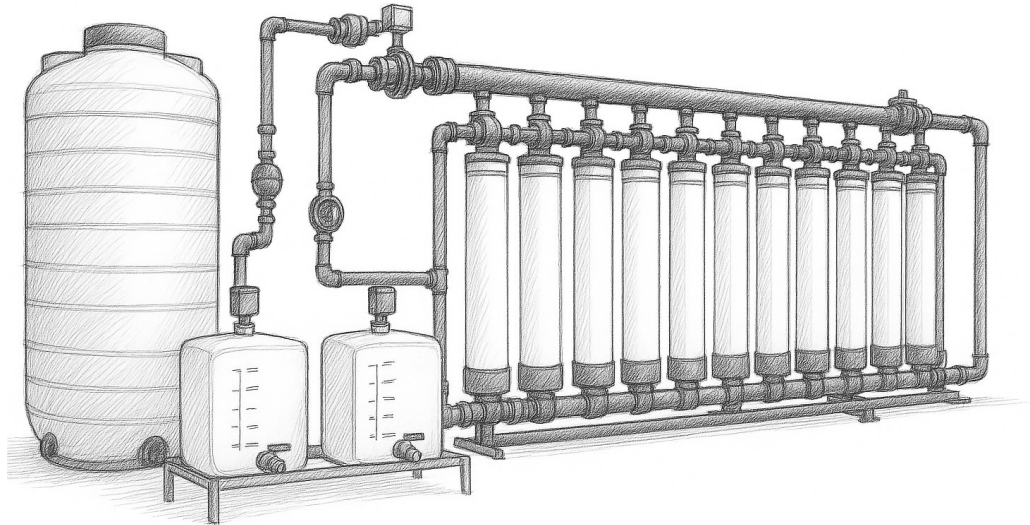


Fast Deployment

Delivered as preassembled packages to minimise site work and reduce installation time.



Technical Specifications



| PARAMETER | SPECIFICATION |
|--|--|
| Capacity (m ³ /day) | 50 m ³ /day (expandable to 1,000 m ³ /day) |
| Approximate Footprint (m ²) | 8–10 m ² per 50 m ³ /day unit |
| Energy Consumption (kWh/m ³) | 0.15–0.25 kWh/m ³ |
| Operating Pressure (bar) | 1–3 bar |
| Membrane Type | Polyvinylidene Fluoride (PVDF) / Polyethersulfone (PES) |
| Nominal Pore Size (µm) | 0.01–0.03 µm |
| Backwash Interval (minutes) | Every 30–90 minutes |
| Typical Recovery Rate (%) | 90–98% |
| Operating Temperature Range (°C) | 5°C – 45°C |
| Tare Weight (kg) | ~800–1,200 kg |
| Gross Weight (kg) | ~1,000–1,400 kg |

Typical Treated Effluent Quality

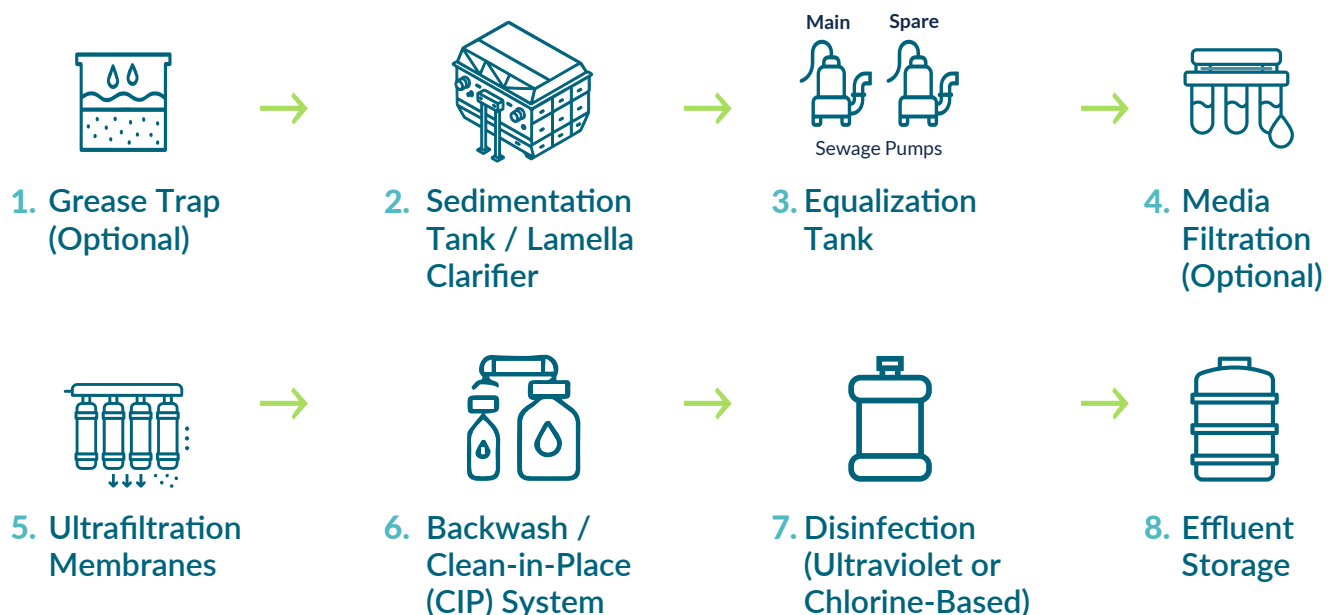
| Parameter | Standard |
|---------------------------------|---|
| BOD (Biochemical Oxygen Demand) | < 10 mg/L |
| COD (Chemical Oxygen Demand) | < 30 mg/L |
| TSS (Total Suspended Solids) | < 5 mg/L |
| Turbidity | < 0.2 NTU (Nephelometric Turbidity Units) |
| Pathogens | > 4-log removal (≥ 99.99% reduction) |

Note:

All values are typical for treated effluent using integrated biological and membrane filtration processes. Units are in milligrams per litre (mg/L) unless otherwise stated.

ULTRAFILTRATION

PROCESS FLOW DIAGRAM



| STAGE | DESCRIPTION |
|---|--|
| 1 Grease Trap (Optional) | An optional pretreatment unit designed to capture fats, oils, and grease (FOG) from greywater sources. This protects downstream treatment stages from clogging and fouling caused by hydrophobic substances. |
| 2 Sedimentation Tank / Lamella Clarifier | A settling tank or inclined plate clarifier that removes suspended solids by gravity separation. Lamella clarifiers use sloped plates to increase settling surface area, improving sludge separation while minimizing footprint. |
| 3 Equalization Tank | Buffers incoming wastewater by balancing flow rate and pollutant loading. This ensures steady hydraulic and organic loading to the ultrafiltration system, which helps maintain optimal membrane performance. |
| 4 Sand or Multimedia Filtration (Optional) | An optional pretreatment step using granular filter media such as sand, anthracite, or gravel to remove coarse particulates. Helps reduce membrane fouling and prolong the cleaning intervals for ultrafiltration membranes. |
| 5 UF Membrane Modules | The core treatment unit uses ultrafiltration (UF) membranes in hollow fiber or flat-sheet configurations. Operates in dead-end or crossflow modes to remove fine suspended solids, bacteria, viruses, turbidity and color pigments as small as 0.02 microns. |
| 6 Backwash / Clean-in-Place (CIP) System | Includes automated backwash cycles and Clean-in-Place (CIP) sequences to restore membrane permeability. Backwash uses a flow reversal to remove surface solids, while CIP uses chemical solutions to dissolve deeper fouling. |
| 7 Disinfection (Ultraviolet or Chlorine-Based) | Final stage applying ultraviolet (UV) disinfection or chlorine dosing to inactivate any remaining pathogens, ensuring the treated water meets standards for safe reuse or discharge. |
| 8 Treated Water Tank | Stores filtered effluent from the ultrafiltration process. Provides hydraulic buffer and ensures consistent water availability for reuse systems, discharge, or further treatment stages. |
| 9 SmartCell Control System (Optional) | An integrated control system that provides real-time monitoring, performance alerts, and automated control of membrane operation, cleaning sequences, and flow management via SCADA (Supervisory Control and Data Acquisition) or PLC (Programmable Logic Controller) platforms. |



Achieve clear, compliant effluent with our high-efficiency ultrafiltration system.

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